



INDUSTRIAL TECHNOLOGIES PROGRAM

Improvements in Efficiency of Melting for Die Casting

Researchers from Case Western Reserve University are conducting a research program that will address the multiple aspects of aluminum melting and handling, increase the energy efficiency of these operations while improving the quality of the molten metal. Currently, melting in the die casting industry is primarily performed in large reverberatory furnaces. The efficiency of these 20,000 to 30,000 pound furnaces is often less than ten percent when gas is used for the melting. From these furnaces, the molten metal is normally transferred to small holding furnaces, close to the die casting machines. The efficiency of these holding furnaces is 10 percent or lower. This procedure is carried over from old practices when use of gas in small furnaces was cost effective because of the lower price of this fuel. However, due to recent trends in fuel prices the cost of this melting procedure has become significantly higher.

The energy consumption of melting in die casting could be reduced significantly if melting were done in partly closed electric powered furnaces or higher efficiency gas furnaces instead of the gas-fired open furnaces currently used. Using modern electrical melting equipment and a partial dip out procedure, it should be possible to reduce energy consumption by over 50 percent, resulting in substantial energy savings of 0.044 Quad over ten years of implementation. The proposed study will involve manufacturers, as well as users, of melting furnaces, insulating materials, degassing and pumping equipment, filtration, and transfer ladles.



Benefits for Our Industry and Our Nation

- *Will reduce energy consumption in aluminum melting and die casting by up to 50 percent.*
- *Potential energy savings of 0.044 Quad in ten years.*

Applications in Our Nation's Industry

The project will significantly reduce the energy consumption of melting in die casting by changing the melting procedures from fuel to electric powered furnaces. This will reduce melting costs from high fuel price and increase energy efficiency for the die casting industry.



Tapping out molten aluminum from a tilting stack furnace

Project Description

This goal of this project is to improve efficiency of melting and molten metal handling in die casting plants by:

- Developing in-plant monitoring methods and procedures of gas and electrical power use in melting and casting operations.
- Training project team and plant personnel in monitoring energy use and identifying potential improvements.
- Conducting energy efficiency surveys of melting and holding furnaces and molten metal handling equipment used in die casting operations.
- Establishing methods and procedures for measuring the energy use in melting and molten metal handling operations.

Milestones

Results to Date

1. Approximately 85% completion has been achieved in a series of experiments to monitor and benchmark energy use and efficiency within a variety of furnace types, including induction, electrical resistance, reverberatory, and gas crucible.
2. An evaluation of metal quality and losses has been conducted to determine how fluidity is affected by cleanliness of the molten aluminum. A paper describing this research was presented at the April 2006 conference of NADCA/AFS.

Future Milestones

1. Demonstrate efficient melting technologies such as high-efficiency burners and radiation panel kits.
2. Develop and conduct training and workshops on the implementation of efficient melting technologies.

Project Partners

Case Western Reserve University
Cleveland, OH

North American Die Casting Association,
Wheeling, IL

Cast Metals Coalition Partnership
Charleston, SC

Inductotherm
Rancocas, NJ

Mercury Marine
Fond du Lac

Spartan Light Metal Products
Sparta, IL

Striko Dynarad
Zeeland, MI

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.



U.S. Department of Energy

Energy Efficiency and Renewable Energy

Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Last updated: 2005